FLINDERSIAN LORICATES

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Plate VII

[Read 10 August 1939]

In preparing this revision of the Flindersian Loricates we have been exceptionally fortunate in having access to the South Australian Museum collection which contains the large collections made by the late Dr. W. G. Torr, Edwin Ashby and the late Sir Joseph Verco and W. L. May. In addition, the valuable material collected by enthusiastic members of the South Australian Malacological Society has been submitted to us for examination. Furthermore, we have, between us, personally collected around a large part of the South Australian coast, as far west as Fowler Bay. Every species has been examined by us personally except *Parachiton opiparus,* the one specimen of which is in the Australian Museum and the doubtful *Acanthochiton deliciosus* Thiele, in the Berlin Museum.

We have not used here many varietal and subspecific names, which are regarded by us as being of little value. The features upon which these are based are not constant and the forms are not confined to distinct geographical boundaries. On the other hand, names are given specific status when the differing features, however small, are constant and can be supported by a separate geographical location. All species in the different Faunal Regions should be allowed a certain amount of variation.

Several names are accepted which have been previously recorded as synonyms. These are, in most cases, the names of some of the rarer species, where lack of material makes it impossible at present to definitely confirm their exact status. It is better to stimulate research by recording them separately; their true status will never be ascertained if they are indiscriminately synonymised with other species.

The first list of South Australian Marine Mollusca was published by Angas in 1865. It contained the names of fourteen species of loricates, several of which have proved to be foreign. In Bednall's list, privately printed in 1876, two more species were added. Adcock's list, published in 1893, contained the names of twenty-one species, but eight of them are certainly not found here.

It was Bednall who, influenced by the publication of Pilsbry's Manual, encouraged by Professor Tate and aided by the collecting of Matthews, made the first attempt to record and classify every genuine South Australian species. In his historical monograph of 1897 thirty-seven species were recorded, only one of which was misidentified.

This timely publication gave an added impetus to local collectors and, during the few years that followed, workers such as Bednall, Matthews, Torr, Ashby, Maughan, Saunders, Kimber and others rapidly added to our knowledge of the variety and number of Loricates found around our shores. So much so, that when Verco's list was printed in 1908, only eleven years later, fifty-two species were recorded, and Torr's paper, published four years later, included sixty-one species.

No list of South Australian Loricates has been published since Torr's Monograph of 1912, but Ashby's 1918 list of Australian species, credited this State with sixty-six species, and Iredales and Hull's Monograph of Australian Loricates lists sixty-seven species recorded from our coasts.

The Systematic List now presented is not confined to the political boundaries of South Australia but covers the whole of the coastline known as the Flindersian Region. This Region extends from Geraldton in Western Australia to Wilson's Promontory in Victoria, and includes the northern and western coasts of Tasmania.

Except for a few extra limital species, the Loricates of this Region form a distinctive group, quite different from those of the Peronian Region in the East and the Dampierian Region in the West.

Pilsbry, in 1892, classified the Loricates into three Superfamilies which he named: Eoplacophora, Mesoplacophora and Teleoplacophora. The wealth of material discovered since makes it advisable to raise the status of these Superfamilies to Orders and to add another Order to include a group widely represented in this Region.

Our classification proceeds from the simpler to the more complex forms and is based upon the study of the valves and girdles alone. The anatomical features do not seem to help in any marked way. Even the radula, which has proved so helpful in the classification of other Orders of Mollusca, varies too much, even in individuals of the same species, to be accepted as a reliable guide. This leaves only the differences in the shell and girdle by which the various forms can be grouped in a satisfactory manner.

Order EOPLACOPHORA

The Order Eoplacophora is characterised by the absence of insertion plates. It is regarded by some workers as the most primitive, representing the forms from which the more highly developed types have evolved. Other workers regard the members as degenerates from the Ischnochitonid group. It has only one Family in this Region, the

LEPIDOPLEURIDAE.

The members have small fragile shells with weak granulose sculpture. The insertion plates are absent and the sutural laminae small and widely separated, the few gills posteriorly situated. It contains two genera, *Terenochiton* and *Parachiton,* separated by the different girdle covering, shape of posterior valve and station.

Although a number of species is found in very deep water, many of the commonest are found in the Laminarian Zone, living in company with and under identical conditions as the Ischnochitons, making the theory of degeneration through environment difficult to accept. The group is probably degenerate from a different and older line than the *Ischnochitonidae*.

It should be noted that the simple forms of this Family do not show the varietal differences common in more elaborately sculptured forms, so that even small differences, when constant, must be regarded as of specific value.

Genus Terenochiton

Terenochiton niger Torr (D11686) is accepted as a distinct species from *T. matthewsianus* Bednall and has a black animal. The holotype of Bednall's species was, unfortunately, lost at sea, and it will never be known for certain whether the animal of the shell he described was red or black. The shells of the two forms show little difference, and *T. niger* Torr has been recorded as a synonym of *T. matthewsianus* Bednall. *T. niger* can be separated on sight from the red-footed form and, although the holotype was from Western Australia, the black-footed variety is found throughout the Region and it seems more reasonable to record it as *T. niger* Torr, than to refer to it as "the black-footed variety of *T. matthewsianus* Bednall."

The Peronian species *Terenochiton badius* Hedley and Hull was first taken at Port Jackson, New South Wales; a similar species was taken by Saunders at Cape Jervis in 1917 and was recorded as *T. badius* Hedley and Hull, 1909. Since then the species has been taken in a number of places as far west as Spencer Gulf. It is our smallest Loricate and in general appearance similar to *T. badius*. The Flindersian species, however, has distinct differences and we here describe it as:

Terenochiton iscus n. sp.

(Pl. vii, fig. 1)

Holotype—Gulf St. Vincent, S. Australia. D1232, S.A.M.

Shell small (5 x 3 mm.), oval, sub-carinated, sculptured with minute granules. Colour, buff to deep orange. Anterior valve, the lateral areas of the median valves and the post-mucronal area of the posterior valve, irregularly granulose. The jugal area is not separated from the pleural area. This central area of the median valves and the anti-mucronal area of the posterior valve, have the pustules arranged in rows. Generally, *T. iscus* has about 40 rows of pustules across the central area with eight pustules in the row.

The Peronian form has about fifty rows with twelve granules to the row. The larger and fewer granules of *T. iscus* give it a slightly coarser appearance.

Ashby has recorded this species as having a buff foot, but over thirty specimens collected by us in Spencer Gulf have had the typical bright red foot of *T. badius*.

The species is usually found attached to soft smooth sand-stone, well buried in sheltered pools. We have never found isolated specimens, they have been in groups or colonies, and the same colour as the rock to which they were attached.

Genus PARACHITON

Parachiton pelagicus Torr, 1912 (D11688) is one of the species now restored to the List. It has been recorded as a synonym of *P. columnarius* Hedley and May. It differs from that species in the angle of divergence, sculpture and shape of the posterior valve, and although paucity of material makes it impossible to decide the exact status of this species at present, enough differences have been recorded to warrant keeping the Flindersian separate from the Peronian species, until a longer series proves whether they are identical or not.

Among specimens dredged by the late Sir Joseph Verco near St. Francis Island was the large posterior valve of a distinctive Loricate, not yet recovered. It is certain that dredging around the Nuyts Archipelago will result in the discovery of the complete shell, and as it cannot be confused with any known species, we name it after its discoverer and describe it as:

Parachiton verconis n. sp.

(Pl. vii, fig. 2)

Holotype—St. Francis Island, S. Australia, D11689, S.A.M.

The posterior valve is 5 x 5 mm., colour a light buff. Anti-mucronal area exceptionally long and covered with about eighty rows of small coalescing granules, giving, where touching, a net-work appearance. Post-mucronal area very short and concave under the mucro, with short rows of coalescing granules and suggestions of growth ridges.

The nearest related species appears to be *P. puppis* Hull, a Peronian species found in a restricted area at Vaucluse, Watson Bay, N.S.W. The number of minutely grained striae in the Flindersian species is less than in the Peronian, giving it a slightly coarser appearance.

Order MESOPLACOPHORA

The Order Mesoplacophora has the insertion plates well developed, although small. The teeth are smooth and the girdles clothed with scales. By some workers it has been regarded as the basic group from which all the other Loricates have either developed or degenerated. Others regard it as the first step from the primitive to the more highly developed forms.

The Order is represented by two Families in this Region.

The first, the *Ischnochitonidae,* includes the simple unspecialized forms with small insertion plates and smooth teeth. The second, the *Callistochitonidae,* while associated with the *Ischnochitonidae* by its radular features, is distinct in the peculiar scalloping of the teeth and elaborate sculpture of the tegmentum.

Genus ISCHNOCHITON

Iredale and Hull's identification of *Ischnochiton elongatus* Blainville and *Ischnochiton lineolatus* Blainville is accepted tentatively. In several publications, *I. elongatus* has been recorded as *I. lineolatus,* and *I. lineolatus* as *I. iredalei* Dup. Blainville's descriptions are meagre, but there is no detail in those descriptions which cannot be applied to those species for which the names are accepted. Also, most workers are familiar with Iredale and Hull's Monograph, and it will prevent further confusion to accept their nomenclature until more definite and independent information can be obtained.

The records of *Ischnochiton variegatus* H. Adams and Angas and *Ischnochiton atkinsoni* Iredale and May, have also been much confused. While there is no comparison between the small coarse unicoloured species from Tasmania and the larger, smoother, mottled species from Yorke Peninsula, it must be admitted that intermediate forms are not easily separated. The great variety of forms found in these species has led to the introduction of species and subspecies which cannot, at present, be recognised as valid.

Ischnochiton (Heterozona) properensis Ashby, 1920, is a valid species and not a local variant of *I. cariosus* Pilsbry, as has beeen recorded. *I. cariosus* has from four to six coarse nodulose rays on the lateral area, *I. properensis* has from eight to ten finer nodulose rays on the lateral area. In general appearance *I. properensis* is much smoother and darker coloured than *I. cariosus.*

Both *Ischnochiton (Heterozona) fruticosus* Gould, 1946, and *Ischnochiton (Haploplax) lentiginosus* Sowerby, 1840, must for the present be regarded as extra-limital species. The records for *lentiginosus* from South Australia are: three specimens from Yankalilla, Matthews' Collection, and one from Robe, Torr Collection, all now in the South Australian Museum.

Ischnochiton (Euporoplax) levis Torr, 1912 (D11976), has been restored to our List. It has been confused with *Ischnochiton (Eurctoplax) wilsoni* Sykes, 1896. Both species have been taken by us in Spencer Gulf and are quite distinct. *I. wilsoni* differs from *I. levis* in its distinctive colour and larger and conspicuous striate girdle scales.

Ischnochiton (Chartoplax) purus Sykes, 1896, has been taken as far west as St. Francis Island by Dr. W. G. Torr. His specimen is undoubtedly this rare species.

Ovatoplax n. subg.

The subgenus *Ovatoplax* is here introduced for *Ischnochiton (Haploplax) mayi* Pilsbry 1895. This species has been placed in various genera—*Ischnochiton, Haploplax, Sypharochiton*—none of which are suitable.

Shell small to medium, ovate and of low elevation. Tegmentum weakly sculptured. Internally as in *Ischnochiton* but separated from that genus by its girdle scales, which are oval, weakly striate and loosely packed.

Sub-genotype—*Ischnochiton (Haploplax) mayi* Pilsbry, 1895.

Genus ISCHNORADSIA

We record all three forms of *Ischnoradsia* in the List. The strongly sculptured Peronian form *(Ischnoradsia australis* Sowerby) is not common in this region, but it has been taken as far west as the South-East coast of South Australia. The weak sculptured form *(I. evanida* Sowerby, 1840) is the common species in this region, while the smooth form *(I. novae-hollandiae* Reeve, 1847) is a variety of doubtful value. The three forms do not confine themselves to geographical boundaries.

Order **Isoplacophora** n. ord.

Shells small to large with large insertion plates and sutural laminae. Girdles large, fleshy and covered with spicules or corneous processes, rarely with scales.

This new Order has been introduced for a large group of Loricates which previously has been included in the Order *Mesoplacophora*. This must not be regarded merely as an artificial arrangement to divide the species into more evenly balanced groups, easier to key. It represents a distinct group of Loricates with probably no close phylogenetic association with either the preceding or following Orders. A number of fossil Loricates examined and classified by Ashby in recent years seem definitely to point to a separate line of evolution.

The Order includes four Families in the Flindersian Region—*Cryptoconchidae, Cryptoplacidae, Choriplacidae* and the *Plaxiphoridae*.

Family CRYPTOCONCHIDAE

In the Family *Cryptoconchidae* the following alterations should be noted:

Genus ACANTHOCHITON

Acanthochiton (Notoplax) rottnestensis Ashby, 1929 (D12565), is placed in the genus *Craspedochiton* Shuttleworth, where it evidently belongs.

Acanthochiton deliciosus Thiele, 1911, has been included with considerable doubt; it is probably a very juvenile specimen of *Acanthochiton kimberi* Torr.

Acanthochiton bednalli variety *johnstoni* Ashby, 1923, we give full specific status. It has never been fully described or figured, so we here describe it.

ACANTHOCHITON JOHNSTONI Ashby, 1923

(Pl. vii, fig. 6)

Holotype—Woodman's Point, W. Australia, D12185; size, 16 x 7 mm.

Shell small to medium, elevation low. Colour white with black or green mottling. Anterior valve—irregularly pustulose. Pustules round and flat. Faint or no undulations. Median valve—lateropleural not separated; irregularly covered with flat round pustules. Jugal area—this area varies considerably, often narrow with six or seven weak striae, but sometimes with nine or ten weak striae. Girdle—large, fleshy and spiculose. Sutural tufts—conspicuous and silvery white.

Similar in general appearance to *A. bednalli,* but that species has ovate pustules, a wider jugum with more, deeper and broken striae and green sutural tufts. *A. johnstoni* can be recognised on sight by the round pustules and white sutural tufts.

Habitat—All around the Flindersian Region, but less common than *bednalli.*

Acanthochiton tatei Torr & Ashby (Neotype, D13732), 1898, takes the place of the Peronian *A. granostriatus* Pilsbry. The differences are small, but the species has the support of geographical locality for validity.

Acanthochiton verconis Torr & Ashby, 1898 (D12201), is returned to the List with considerable doubt. It has been recorded as conspecific with *A. wilsoni* Sykes. The differences may only be varietal but, until larger series prove them definitely identical, we prefer to leave them separate. *A. verconis* may be the weaker western end of the series or a deep water form of *A. wilsoni.*

Acanthochiton lachrymosus May & Torr, 1912, is accepted as the Flindersian representative of *A. coxi* Pilsbry. It differs from the Peronian species in the wider jugal area, tear-drop pustules more confused and over-lapping and smaller and finer girdle spicules; these minor differences added to its geographical location supply our reason for recording it as a separate species.

Genus NOTOPLAX

In the *Notoplax* series, the records of *Notoplax speciosa* H. Adams, 1861, *Notoplax subspeciosa* Iredale & Hull, 1925, and *Notoplax spongialis* Ashby, 1923, have been confused.

Examination of the material in the South Australian Museum and consultation with the British Museum authorities has convinced us that all three are distinct species and that all three have been recorded as *N. speciosa* H. Adams.

Notoplax speciosa H. Adams, as described by Pilsbry, appears to be the large fleshy-girdled *Cryptoplax*-like animal with short thick spicules. It inhabits sponges and has been found in Tasmania and as far west as Streaky Bay. *Notoplax spongialis* is similar and also lives in sponges. It differs from *N. speciosa* in its felt-like girdle. This species is found in Tasmanian waters and as far west as Gulf St. Vincent. At the western end of the region a slight variation is found in the sculpture, and this form is now known as *Notoplax glauerti* Ashby, 1923.

Notoplax subspeciosa Iredale & Hull is an entirely different animal, which lives attached to rocks. In life the wide thin girdle spreads over the valves until only the jugum is exposed. All that is seen of the shell is eight short coloured lines drawn through a large oblong spiculose girdle. This species is not uncommon and is recorded as far west as Western Australia.

Notoplax rubrostrata Torr, 1912 (D13717), is not associated with the "*speciosa*" group. It is the Flindersian representative of *Notoplax costata* H. Adams & Angas. It differs from that species in being smaller and weaker sculptured. The ribbing of the anterior valve and lateropleural areas is nodulose instead of continuous. The pustules of pleural area are less pronounced, and the post-mucronal area is less distinctly noduled. As with many other species it grows larger and more strongly sculptured in the colder waters of Tasmania, where it has been named *N. extra* Iredale & Hull. Both the rose- and plum-coloured specimens are found in South Australian waters.

Crocochiton n. gen.

The new genus *Crocochiton* is here introduced for the peculiar species *Acanthochiton crocodilus* Torr & Ashby.

Shell medium to large, elongate, wide, elevation low. Sculpture of tegmentum triangular pustules. Anterior valve with five slits, median valves one and posterior valve multi-slit. Girdle spongy and spiculose. Genotype—*Acanthochiton crocodilus* Torr & Ashby.

There does not appear to have been any other specimen of this rare species taken since Dr. Torr found two at Marino over thirty years ago, but valves found in shell sand along the western coast of Yorke Peninsula point to the existence of much larger varieties, if not new species.

Family CRYPTOPLACIDAE

In the Family *Cryptoplacidae,* one new species has been added to the list.

Genus CRYPTOPLAX

Ashby's holotype of *Cryptoplax striata* var. *westernensis,* 1923 (D10717), conforms so closely to the description of *Cryptoplax striata occidentalis* Iredale & Hull, 1925, that we are compelled to regard them as conspecific, Ashby's name having prior claim. As no adequate description or figure of either has been given, we add the following description:

CRYPTOPLAX WESTERNENSIS Ashby, 1923

(Pl. vii, fig. 4)

Shell medium. Valves almost as wide as long, their sides forming an obtuse angle making the beak very sharp. The tegmentum is sculptured with rows of large granules. Anterior valve—as broad as long. Median valves—close, flat and shield shaped. Posterior valve—mucro terminal. Girdle—similar to *"striata."*

This species is separated from *C. striata* Lamarck by its wide, flat, pointed median valves and sculpture of nodulose ridges. (In living examples the valves will probably be spaced differently.)

We are giving this form specific status because of its distinctive features and because it does not appear to blend with eastern varieties.

The holotype we figure is an old badly crumpled, eroded specimen.

Choriplacidae n. fam.

The Family *Choriplacidae* is here introduced for the unique genus *Choriplax.* The known specimens are so entirely different from other species, that this seems the wisest thing to do in the interest of accurate classification. Characters of the Family are:

Shells of medium size, elongate. Girdle thin and horny, covering the whole of the shell like a periostracum, except the apices of the valves which constitute the tegmentum. Articulamentum very large. Sutural laminae and sinus obsolete. Insertion plate large, unslit or slits obsolete. The whole shell transparent.

We list it directly after *Cryptoplax*, of which it may be a highly specialized form.

Choriplax pattisoni Ashby, 1921, the unique specimen of which is now before us, is likely to remain rare, for a Loricate that dwells in the giant kelp forests in the turbulent depths of the Pacific Ocean, is fairly safe from even the most persistent and enthusiastic collector.

Family PLAXIPHORIDAE

Genus PONEROPLAX

Records of the species of *Poneroplax*, in the Family *Plaxiphoridae*, have been thoroughly confused. The species, which are emergent ones, are so abundant around the southern coast of Australia and Tasmania, that they were probably taken to Europe by every exploring vessel that visited these shores. Consequently, they were named by Blainville, Quoy and Gaimard, Haddon, Sowerby, H. Adams and Angas, besides Pilsbry and Thiele. With exceptionally variable species and such a large variety of names to choose from, the quandary of early workers can be understood.

We are following Iredale & Hull in recording the smooth form as *P. costata* Blainville and the wrinkled form as *P. albida* Blainville. We do this to prevent adding to the confusion and because we think this identity more probable. The recorded opinions of Thiele and Ashby, who both examined the holotypes in the Paris Museum, however, do not appear to coincide with Iredale's and Hull's.

Poneroplax conspersa H. Adams & Angas, 1864, is given full specific status. This highly sculptured form is easily distinguished by the two ribs on the lateral area. It is not confined to Port Lincoln but has been taken by us all around the South Australian coast, from the Bight to MacDonnell Bay.

Genus KOPIONELLA

The genus *Kopionella* we have also placed in the Family *Plaxiphoridae*. In general appearance, sculpture and girdle it appears to be more closely allied to that group than to the *Loricidae*.

Order TELEOPLACOPHORA

The Order *Teleoplacophora* contains all the most highly developed forms. It includes a variety of species which vary greatly in external and internal features but all have reached a high state of development. The characteristic feature of the Order is the grooved or pectinated teeth of the insertion plates. It contains three Families, the *Loricidae, Lepidochitonidae* and *Chitonidae.* In the first Family one species is here described as new:

Family LORICIDAE

Lorica elliottae n. sp.

(Pl. vii, fig. 9)

Holotype—Rottnest Island, W. Australia, D11658, S.A.M.

Shell large; size, 71 x 34 mm. Altitude, 24 mm.; angle of divergence, 40. Semi-carinated, colour brown. Anterior valve—erect, curving forward at the top. The sculpture consists of about seventy finely granulated rays. Under the lens fine longitudinal ridges give a net-work appearance. Median valves—lateral area with about twelve fine ridges becoming weak and obsolete at the jugum, netted with fine longitudinal ridges. Pleural area with eight or nine finely granulated rays. Posterior valve—small, mucro posterior, recurved. Sculptured as lateral areas. Girdle—generic.

Habitat—Rottnest Island, W. Australia, and Corny Point, S. Australia. Collected by Mrs. L. A. Elliott.

Family LEPIDOCHITONIDAE

The Family *Lepidochitonidae* is included in this Order. The well-developed grooved insertion plates, the highly specialized girdle covering and the presence of eyes in some of the species, all denote an advanced group.

Acutoplax n. gen.

A new genus is here introduced for the reception of several species:

Shell small to medium, elongate oval, elevated and carinated. Sculptured with longitudinal sulci on the pleural areas. Girdle of packed spicules. Well developed insertion plates with grooved teeth. End and median valves multi-slit. Genotype—*Callochiton mayi* Torr, 1912.

Differs from the South American genus *Icoplax* in the multi-slit insertion plates of the median valves and the sulci of the pleural area.

Family CHITONIDAE

In the Family *Chitonidae* we have accepted the generic name *Anthochiton* Thiele instead of *Rhyssoplax* Thiele, which has been used for our Australian species. The name *Rhyssoplax* has page priority over *Anthochiton,* but the Genotype of *Rhyssoplax, Chiton affinis* Issel in no way represents our shells. The genotype of *Anthochiton, Chiton tulipa* Quoy and Gaimard, is a South African species which approaches more nearly our own forms.

Genus MUCROSQUAMA

Two new species are here described in the genus *Mucrosquama.* The first was dredged by Sir J. Verco in Hardwicke Bay, and recorded by Torr in 1912 as

Chiton limans Sykes. The record was ignored and doubted because *C. limans* (= *Mucrosquama carnosa* Angas) is definitely a Peronian species. However, Verco was scrupulously careful regarding the locality of species he collected and the locality has never been dredged since. This, added to the fact that the specimen has a number of distinct differences from the Peronian specimens, induces us to describe it as:

Mucrosquama nielseni n. sp

(Pl. vii, fig. 8)

Holotype—Hardwicke Bay, S. Australia, D13720, S.A.M.

Shell of medium size, elevated and carinated. Colour pale ochreous yellow with light and dark brown blotches on some of the valves. Anterior valve—erect, with ten weak pustulose rays and a few pustules in the interstices. Median valves—lateral areas with two to four pustulose rays. Pustules of the posterior edge projecting as teeth. Pleural area with from five to eight ridges crossing the area and a few weak ridges partly crossing it and fading out towards the jugum, leaving a large smooth triangular jugal area. Posterior valve—antimucronal area with a few weak ridges. Postmucronal area with ten rays of two or three pustules. Girdle—generic. Microscopically striate.

Mucrosquama nielseni is undoubtedly the Flindersian representative of *M. carnosa* Angas. In *M. carnosa* most of the ridges cross the pleural area, in *M. nielseni* half of the ridges cross that area. The two species bear the similar relationship to each other, as *Anthochiton jugosus* does to *Anthochiton diaphorus*. We feel confident that further dredgings will produce more specimens.

The second species was dredged in Spencer Gulf in March, 1938, by Mr. K. Sheard, from the Fisheries launch "Whyalla." We describe and figure it as:

Mucrosquama sheardi n. sp.

Holotype—Dredged Spencer Gulf, S. Australia, D13721, S.A.M.

Shell of medium size (25 x 10 mm.), elevated and carinated, colour cream blotched with dark green and brown. Anterior valve—sculptured with eleven rows of irregular oval and round nodules, about nine nodules in a row, diminishing in size towards the apex. Median valve—lateral area with two rows of strong round or oval nodules, about ten in a row, diminishing in size towards the jugum. Pleural area with about fifteen fine grooves. Posterior valve—mucro anti-median. Antimucronal area grooved as pleural area. Post-mucronal area with twelve short radial rows of small nodules, about five or six in a row. Jugal area—weakly grooved, with grooves fading out towards the apex leaving apex smooth. Girdle—clothed with strongly striate and mucronate scales.

This species is closely allied to *Mucrosquama verconis* Torr & Ashby, 1898 (D12380), but differs from that species in colour and sculpture. The nodules of the lateral areas, anterior and posterior valves, are smaller, rounder and more separated than the wide, oval interlapping nodules of *M. verconis*. The fine grooves or ridges of the pleural areas are less oblique than those of *M. verconis*, being almost straight across. The predominating colour of *M. verconis* is pink, while that of *M. sheardi* is green.

Genus SYPHAROCHITON

Sypharochiton maugeanus Iredale & May, 1916, is included in the List. This species is the Tasmanian representative of the New Zealand *Sypharochiton pelliserpentis* Quoy & Gaimard. It differs so little from that species that its validity will always be questioned. We include it because its minor differences are supported by geographical grounds.

Genus ONITHOCHITON

On the above grounds we have also allowed *Onithochiton occidentalis* Ashby, 1929, specific status. Individual specimens of *Onithochiton quercinus* Gould, 1846, from the Eastern States, will always be found that are difficult, if not impossible to separate from the western species. However, the western forms average out much larger and smoother than the eastern forms, and this, with the minor differences cited by Ashby and the geographical locality, influenced us in giving it full specific status.

KEYS TO THE LORICATES OF THE FLINDERSIAN REGION

Key to Orders

a. Insertion plates absent or almost obsolete	EOPLACOPHORA
aa. Insertion plates developed	
b. Teeth smooth	
c. Insertion plates small, girdles clothed with scales	MESOPLACOPHORA
cc. Insertion plates large, girdles leathery, spiculose, or with corneous processes, rarely with scales	ISOPLACOPHORA
bb. Teeth grooved, striate or pectinate	TELEOPLACOPHORA

Order EOPLACOPHORA

with one Family in this Region

Family LEPIDOPLEURIDAE

Key to Genera

a. Girdles with scales, posterior valve normal	*Terenochiton*
aa. Girdles spiculose, posterior valve abnormally long	*Parachiton*

Genus TERENOCHITON

Key to Species

a. Anterior valve with regular granulose rays	
b. Lateral area even	
c. Animal red	*matthewsianus*
cc. Animal black	*niger*
bb. Lateral areas corrugated	*liratus*
aa. Anterior valve irregularly granulose	
d. Shell sub-carinated	*iscus*
dd. Shell strongly carinated	*glauerti*

Genus Parachiton

Key to Species

a. Sculpture granulose
b. Posterior valve normal, mucro not extremely posterior
c. Shell highly elevated, lateral areas smooth .. .. .. *pelagicus*
cc. Shell of normal elevation, lateral areas corrugated .. *collusor*
bb. Posterior valve abnormally large, mucro extremely posterior *verconis*
aa. Sculpture matt, not granulose .. .. *opiparus*

Order Mesoplacophora

Key to Families

a. Teeth not scalloped .. .. Ischnochitonidae
aa. Teeth scalloped .. .. Callistochitonidae

Family Ischnochitonidae

Key to Genera

a. Insertion plates of median valves unslit, or slits obsolete .. *Subterenochiton*
aa. Insertion plates of median valves slit
b. Insertion plates with one slit .. .. *Ischnochiton*
bb. Insertion plates multi-slit
c. Girdle scales minute, shells polished .. .. *Stenochiton*
cc. Girdle scales large, shells sculptured .. .. .. *Ischnoradsia*

Genus Subterenochiton

Key to Species

a. Sculpture weak, irregularly granulose .. .. *gabrieli*
aa. Sculpture strong, granules in rows .. .. *bednalli*

Genus Ischnochiton

Key to Subgenera

a. Lateral area radially sculptured
b. Girdle scales medium size, oval and striate .. .. .. *Ischnochiton*
bb. Girdle scales of various size and shape .. .. .. *Heterozona*
c. Girdle scales not mucronate
d. Scales microscopic and closely packed .. .. .. *Autochiton*
dd. Scales medium size, loosely packed .. .. .. *Ovatoplax*
cc. Girdle scales mucronate .. .. *Strigichiton*
aa. Lateral areas smooth
e. Girdle scales convex and glossy .. .. *Haploplax*
ee. Girdle scales not convex and glossy
f. Girdle scales oval and striate
g. Girdle scales conspicuously striate .. .. .. *Euretoplax*
gg. Girdle scales microscopically striate .. .. *Euporoplax*
ff. Girdle scales flat and smooth .. .. *Chartoplax*

Genus Ischnochiton

Key to Species

a. Anterior valve with medium to strong radial ribs
b. Girdle scales large .. .. *milligani*
bb. Girdle scales medium or small
c. Anterior valve nodulosely ribbed
d. Girdle scales medium, striae of pleural area zig-zag .. *lineolatus*
dd. Girdle scales small, striae of pleural area not zig-zag
e. Pleural area finely granulose .. .. *variegatus*
ee. Pleural area coarsely granulose .. .. .. *atkinsoni*
cc. Anterior valve not nodulosely ribbed
f. Pleural area coarsely pustulose and edge of lateral area not toothed .. .. *pilsbryi*
ff. Pleural area not coarsely pustulose but edge of lateral area toothed
g. Striae of pleural area wrinkled .. .. .. *ptychius*
gg. Striae of pleural area not wrinkled .. .. *tateanus*

aa. Anterior valve not radially ribbed or ribs weak and obsolete
h. Ribs weak and obsolete
i. Pleural area strongly ridged .. .. .. *falcatus*
ii. Pleural area not ridged .. .. .. *elongatus*
hh. Anterior valve not ribbed, sculptured with separate pustules .. .. *contractus*

Subgenus HETEROZONA

Key to Species

a. Lateral areas strongly nodulosely ribbed
b. Ribs divaricating .. .. *fruticosus*
bb. Ribs not divaricating
c. Girdle with intermingled large scales .. .. .. *cariosus*
cc. Girdle with no intermingled large scales .. .. .. *subviridis*
aa. Lateral areas weakly nodulosely ribbed .. .. *properensis*

Subgenus AUTOCHITON

One species only .. .. *torri*

Subgenus OVATOPLAX

One species only .. .. *mayi*

Subgenus STRIGICHITON

One species only .. .. *verconis*

Subgenus HAPLOPLAX

Key to Species

a. Girdle scales of various size
b. Surface of shell glossy, colour variable .. .. .. *smaragdinus*
bb. Surface of shell matt, colour distinctive .. .. .. *resplendens*
aa. Girdle scales of equal size
c. Shell broadly ovate, elevation low, scales large .. .. *lentiginosus*
cc. Shell elongate oval, elevation medium, scales small .. *thomasi*

Subgenus EUPOROPLAX

Key to Species

a. Shell small, elevated, elongated oval .. .. *virgatus*
aa. Shell medium in size and elevation, ovate .. .. .. *levis*

Subgenus EURETOPLAX

One species only .. .. *wilsoni*

Subgenus CHARTOPLAX

One species only .. .. *purus*

Genus STENOCHITON

Key to Species

a. Anterior valve longer than wide
b. Shell seven times long as wide, colour brownish .. .. *longicymba*
bb. Shell three or four times long as wide
c. Shell low, girdle not curling under .. .. *pilsbryanus*
cc. Shell elevated, girdle curling under .. .. .. *cymodocealis*
aa. Anterior valve wider than long .. .. *pallens*

Genus ISCHNORADSIA

Key to Species

a. Pleural area sulcated
b. Sulcations continuous and strong .. .. *australis*
bb. Sulcations short and weak .. .. *evanida*
aa. Pleural area not sulcated .. .. *novae hollandia*

Family CALLISTOCHITONIDAE

Key to Genera

a. Sutural laminae separated .. .. *Callistelasma*
aa. Sutural laminae continuous .. .. *Callistassecla*

Genus CALLISTELASMA

One species only .. .. *meridionalis*

Genus CALLISTASSECLA

One species only .. .. *mawlei*

Order ISOPLACOPHORA

Key to Families

a. Anterior valve with less than eight slits
  b. Tegmentum of valves imbricating .. .. CRYPTOCONCHIDAE
  bb. Tegmentum of valves not imbricating
    c. Girdle large and fleshy .. .. CRYPTOPLACIDAE
    cc. Girdle reduced to a thin skin .. .. CHORIPLACIDAE
aa. Anterior valve with eight or more slits .. .. PLAXIPHORIDAE

Family CRYPTOCONCHIDAE

Key to Genera

a. Sculpture pustulose
  b. Girdle finely scaly
    c. Girdle anteriorly produced .. .. *Craspedochiton*
    cc. Girdle normal .. .. *Craspedoplax*
  bb. Girdle not scaly
    d. Insertion plates and sutural laminae normal size
      e. Posterior insertion plate directed backwards .. .. *Meturoplax*
      ee. Posterior insertion plate normal .. .. .. *Acanthochiton*
    dd. Insertion plates and sutural laminae large and wing-shaped .. .. *Notoplax*
aa. Sculpture not pustulose
      f. Sculpture mostly linear .. .. *Bassethullia*
      ff. Sculpture triangular .. .. *Crocochiton*

Genus CRASPEDOCHITON

One species only .. .. *rottnestensis*

Genus CRASPEDOPLAX

Key to Species

a. Sculptured with fine granules, common in shallow water .. *variabilis*
aa. Sculptured with coarser granules, rare and dredged .. .. *cornuta*

Genus METUROPLAX

One species only .. .. *retrojecta*

Genus ACANTHOCHITON

Key to Species

a. Girdle leathery
  b. Postulose sculpture irregular
    c. Pustules of various sizes
      d. Jugal area granulose .. .. *kimberi*
      dd. Jugal area pitted .. .. *deliciosus*
    cc. Pustules of similar size .. .. *sueurii*
  bb. Pustulose sculpture in regular rows .. .. *pilsbryi*
aa. Girdle spiculose
    e. Girdle of medium size, sutural tufts conspicuous
      f. Jugal area finely pustulose .. .. *gatliffi*
      ff. Jugal area not pustulose
        g. Jugum grooved .. .. *bednalli*
        gg. Jugum not grooved but lined
          h. Pustules round and flat .. .. *johnstoni*
          hh. Pustules elliptical .. .. *tatei*
    ee. Girdle large, sutural tufts not conspicuous
      i. Pustulose sculpture fine
        j. Jugal area narrow, pustules crowded .. *wilsoni*
        jj. Jugum wider, pustules less crowded .. *verconis*
      ii. Pustulose sculpture coarse, tear-shaped .. *lachrymosus*

Genus Notoplax

Key to Species

a. Girdle thickly spiculose, ribs not prominent
  b. Girdle coarsely spiculose
    c. Girdle large and fleshy, spicules short and thick .. .. *speciosa*
    cc. Girdle wide and thin spicules longer .. .. .. *subspeciosa*
  bb. Girdle finely spiculose
    d. Post-mucronal area not ribbed .. .. *spongialis*
    dd. Post-mucronal area ribbed .. .. *glauerti*
aa. Girdle leathery with spinelets, ribs prominent.
    e. With one nodulose rib on the median valves .. .. *rubrostrata*
    ee. With two nodulose ribs on the median valves .. *subviridis*

Genus Bassethullia

Key to Species

a. Pleural area sculptured .. .. *matthewsi*
aa. Pleural area smooth .. .. *glypta*

Genus Crocochiton

One species only .. .. *crocodilus*

Family Cryptoplacidae

One genus only .. .. *Cryptoplax*

Genus Cryptoplax

Key to Species

a. Girdle coarsely spiculose
  b. Sculptured with crumpled or wavy ridges .. .. .. *striata*
  bb. Sculptured with nodulose ridges .. .. *westernensis*
aa. Girdle finely spiculose .. .. *iredalei*

Family Choriplacidae

One genus only .. .. *Choriplax*

Genus Choriplax

One species only .. .. *pattisoni*

Family Plaxiphoridae

Key to Genera

a. Lateral area defined by smooth or wrinkled ridges, girdle with corneous processes only, posterior valve not recurved .. .. *Poneroplax*
aa. Lateral area defined by nodulose ridges, girdle with corneous processes and oar-headed spicules, posterior valve recurved .. *Kopionella*

Genus Poneroplax

Key to Species

a. Pleural area not concentrically wrinkled .. .. *costata*
aa. Pleural area concentrically wrinkled
  b. Lateral area with one radial rib .. .. *albida*
  bb. Lateral area with two radial ribs .. .. *conspersa*

Genus Kopionella

One species only .. .. *matthewsi*

Order Teleoplacophora

Key to Families

a. Teeth not finely pectinate
  b. No insertion plate in posterior valve .. .. LORICIDAE
  bb. Insertion plates in all valves .. .. LEPIDOCHITONIDAE
aa. Teeth finely pectinated .. .. CHITONIDAE

Family Loricidae

Key to Genera

a. Anterior valve abnormally large .. .. *Loricella*
aa. Anterior valve of normal size .. .. *Lorica*

Genus LORICELLA

One species only	*angasi*

Genus LORICA

Key to Species

a. Elevation medium, shell broad	*cimolia*
aa. Elevation high, shell narrow	*elliottae*

Family LEPIDOCHITONIDAE

Key to Genera

a. Shells not sculptured	
b. Shells large with leathery girdle	*Eudoxoplax*
bb. Shells small or medium, packed spiculose girdle	*Paricoplax*
aa. Shells with pleural area grooved	*Acutoplax*

Genus EUDOXOPLAX

One species only	*inornata*

Genus PARICOPLAX

One species only	*crocina*

Genus ACUTOPLAX

Key to Species

a. Most sulci extending across the pleural area	*mayi*
aa. Most sulci not extending across the pleural area	
b. Sulci extending half-way across the pleural area	*rufa*
bb. Sulci extending one-fourth of the pleural area	*klemi*

Family CHITONIDAE

Key to Genera

a. Girdles scaly	
b. Scales tightly imbricating	
c. Apices of scales round	*Anthochiton*
cc. Apices of scales pointed	*Mucrosquama*
bb. Scales large and loose	
d. Posterior valve with insertion plate	*Sypharochiton*
dd. Posterior valve callused	*Clavarizona*
aa. Girdles not scaly	
e. Girdle with calcareous spines	*Acanthozostera*
ee. Girdle not spinose	
f. Girdle fleshy with microscopic scales	*Onithella*
ff. Girdle fleshy with fine spicules	
g. Posterior valve callused	*Onithochiton*
gg. Posterior valve with insertion plate	*Lucilina*

Genus ANTHOCHITON

Key to Species

a. Anterior valve smooth	
b. Scales small and oval	*oruktus*
bb. Scales large and sub-oval	
c. Pleural sculpture weak	*torrianus*
cc. Pleural sculpture strong	*diaphorus*
aa. Anterior valve ribbed	
d. Lateral ribs non-nodulose	
e. Interstices of lateral ribs not pitted	*calliozonus*
ee. Interstices of lateral ribs pitted	
f. Radial sculpture strong	*bednalli*
ff. Radial sculpture weak	*exoptandus*
dd. Lateral ribs nodulose	
g. Longitudinal sculpture strong	*tricostalis*
gg. Longitudinal sculpture weak	*geraldtonensis*

Genus Mucrosquama

Key to Species

a. Anterior valve ribbed	*nielseni*
aa. Anterior valve not ribbed	
b. Sculpture of lateral areas round separate nodules	*sheardi*
bb. Sculpture of lateral areas oval interlapping nodules	*verconis*

Genus Sypharochiton

One species only	*maugeanus*

Genus Clavarizona

One species only	*hirtosa*

Genus Acanthozostera

One species only	*gemmata*

Genus Onithella

One species only	*ashbyi*

Genus Onithochiton

One species only	*occidentalis*

Genus Lucilina

One species only	*hulliana*

A SYSTEMATIC LIST OF THE LORICATES OF THE FLINDERSIAN REGION

Phylum MOLLUSCA

Class LORICATA

Order MESOPLACOPHORA

LEPIDOPLEURIDAE

TERENOCHITON Iredale, 1914 (*subtropicalis* Iredale)—*matthewsianus* Bednall, 1906, Gulf St. Vincent, South Australia (Neotype, D13734); *niger* Torr, 1911, Hopetoun, Western Australia (D11686); *liratus* H. Adams & Angas, 1864, Yorke Peninsula, South Australia (Neotype, D13735); *iscus* n. sp., Gulf St. Vincent, South Australia (D1232); *glauerti* Ashby, 1928, Rottnest Island, Western Australia.

PARACHITON Thiele, 1909 (*acuminatus* Thiele)—*pelagicus* Torr, 1912, off Cape Jaffa, South Australia (D11688); *collusor* Iredale & Hull, 1925, Gulf St. Vincent, South Australia (D11288); *verconis* n. sp., off St. Francis Island, South Australia (D11689); *opiparus* Iredale & Hull, 1926, off Cape Wiles, South Australia.

Order MESOPLACOPHORA

ISCHNOCHITONIDAE

SUBTERENOCHITON Iredale & Hull, 1924 (*gabrieli* Hull)—*gabrieli* Hull, 1912, Western Port, Victoria; *bednalli* Torr, 1912, St. Francis Island, South Australia (D11792).

ISCHNOCHITON Gray, 1847 (*textilis* Gray)—*milligani* Iredale & May, 1916, Port Arthur, Tasmania; *lineolatus* Blainville, 1826, Ile King, Bass Strait; *variegatus* H. Adams & Angas, 1864, Yorke Peninsula, South Australia (Neotype, D13736); *atkinsoni* Iredale & May, 1916, Sulphur Creek, North-west Tasmania; *pilsbryi* Bednall, 1897, Sultana Bay, South Australia (Neotype, D11766); *ptychius* Pilsbry, 1894, Gulf St. Vincent, South Australia; *tateanus* Bednall, 1897, Sultana Bay, South Australia (Neotype, D13738); *falcatus* Hull, 1912, Western Port, Victoria; *elongatus* Blainville, 1825, New Holland; *contractus* Reeves, 1847, New Zealand, (error) South Australia.

s.g. Heterozona Dall, 1878 (*cariosa* Dall)—*fruticosus* Gould, 1846, New South Wales; *cariosus* Dall, 1878, Australia; *subviridis* Iredale & May, 1916, Port Arthur, Tasmania; *properensis* Ashby, 1920, Proper Bay, Spencer Gulf, South Australia (D11896).

s.g. AUTOCHITON Iredale & Hull, 1924 *(torri* Iredale & May)—*torri* Iredale and May, 1916, Bass Strait, Tasmania.

s.g. OVATOPLAX n. sg. *(mayi* Pilsbry)—*mayi* Pilsbry, 1895, Eagle Hawk Neck, East Tasmania.

s.g. STRIGICHITON Hull, 1923 *(verconis* Torr)—*verconis,* 1911, Ellenbrook, Western Australia (D12868).

s.g. HAPLOPLAX Pilsbry, 1894 *(smaragdina* Pilsbry)—*smaragdinus* Angas, 1864, Port Jackson, New South Wales; *resplendens* Bednall & Matthew, 1906, Gulf St. Vincent, South Australia (Neotype, P13739); *lentiginosus* Sowerby, 1840, Australia; *thomasi* Bednall, 1897, Marino, South Australia (Neotype, D13737).

s.g. EUPOEOPLAX Iredale & Hull, 1924 *(virgatus* Reeve)—*virgatus* Reeve, 1847, Port Lincoln, South Australia; *levis* Torr, 1912, Edithburgh, South Australia.

s.g. EURETOPLAX Iredale & Hull, 1924 *(wilsoni* Sykes)—*wilsoni* Sykes, 1896, Port Phillip, Victoria.

s.g. CHARTOPLAX Iredale & Hull, 1925 *(purus)*—*purus* Sykes, 1896, Port Phillip, Victoria.

STENOCHITON H. Adams & Angas, 1864 *(juloides* H. Adams & Angas)—*longicymba* Blainville, 1825, Kangaroo Island, South Australia; *pilsbryanus* Bednall, 1897, Troubridge Shoal, South Australia; *cymodocealis* Ashby, 1918, Marino, South Australia (D981); *pallens* Ashby, 1900, Gulf St. Vincent, South Australia (D978).

ISCHNORADSIA Shuttleworth, 1853 *(australis* Sowerby)—*australis* Sowerby, 1840, Australia; *evanida* Sowerby, 1840, New Holland; *novae-hollandiae* Reeve, 1847, New Holland.

CALLISTOCHITONIDAE

CALLISTELASMA Iredale & Hull, 1925 *(antiquus* Reeve)—*meridionalis* Ashby, 1919, Marino, South Australia (D13716).

CALLISTASSECLA Iredale & Hull, 1925 *(mawlei* Iredale & May)—*mawlei* Iredale & May, 1916, Port Arthur, Tasmania.

Order ISOPLACOPHORA

CRYPTOCONCHIDAE

CRASPEDOCHITON Shuttleworth, 1853 *(laqueatus* Sowerby)—*rottnestensis* Ashby, 1929, Bathurst Point, Western Australia (D12565).

CRASPEDOPLAX Iredale & Hull, 1925 *(variabilis* H. Adams & Angas)—*variabilis* H. Adams & Angas, 1864, Yorke Peninsula, South Australia (Neotype, D13740); *cornuta* Torr & Ashby, 1898, Marino, South Australia (D12188).

METUROPLAX Pilsbry, 1894 *(retrojecta* Pilsbry)—*retrojecta* Pilsbry, 1894, Port Jackson, New South Wales.

ACANTHOCHITON Gray, 1821 *(fascicularis* Linn.)—*kimberi* Torr, 1912, Aldinga, South Australia (Neotype D13758); *deliciosus* Thiele, 1911, Bunbury, South Western Australia; *sueurii* Blainville, 1825, King George Sound, South Western Australia; *pilsbryi* Sykes, 1898, Port Phillip, Victoria; *gatliffi* Ashby, 1918, Port Lincoln, South Australia (D12189); *bednalli* Pilsbry, 1894, Gulf St. Vincent, South Australia; *johnstoni* Ashby, 1923, Carnarvon, Western Australia (D12185); *tatei* Torr & Ashby, 1898, Encounter Bay, South Australia; *wilsoni* Sykes, 1896, Port Phillip, Victoria; *verconis* Torr & Ashby, 1898, Gulf St. Vincent, South Australia (D12201) *lachrymosus* May & Torr, 1912, Frederick Henry Bay, Tasmania.

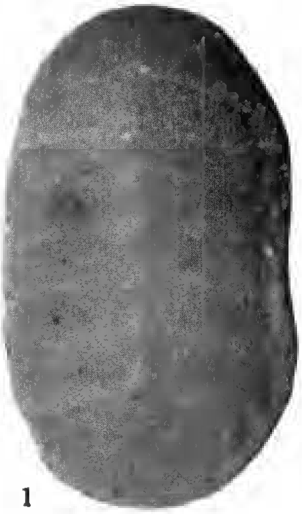
NOTOPLAX H. Adams, 1861 *(speciosa* H. Adams)—*speciosa* H. Adams, 1861, Tasmania; *subspeciosa* Iredale & Hull, 1926, Port Arthur, Tasmania; *spongialis* Ashby, 1923, D'Entrecasteaux Channel, South Tasmania (D13733); *glauerti* Ashby, 1923, Cottesloe, Western Australia; *rubrostrata* Torr, 1912, St. Francis Island, South Australia (D13717); *subviridis* Torr, 1911, Albany, Western Australia (D12872).

BASSETHULLIA Pilsbry, 1928 *(matthewsi* Pilsbry)—*matthewsi* Pilsbry, 1894, Yorke Peninsula, South Australia (Neotype, D1374); *glypta* Sykes, 1896, Port Philip, Victoria.

CROCOCHITON n. gen. *(crocodilus* Torr & Ashby)—*crocodilus* Torr & Ashby, 1898, Marino, South Australia (D12137).

CRYPTOPLACIDAE

CRYPTOPLAX Blainville, 1818 *(larvaeformis* Burrow)—*striata* Lamark, 1819, Kangaroo Island, South Australia; *westernensis* Ashby, 1923, Rottnest Island, Western Australia (D10717); *iredalei* Ashby, 1923, Port Lincoln, South Australia (D12306).



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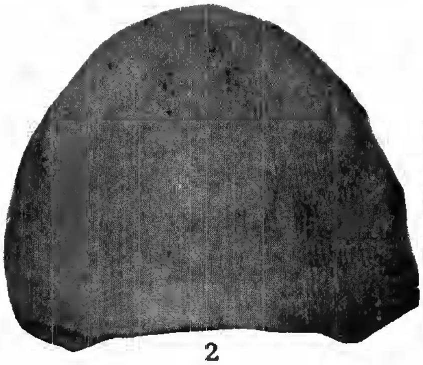

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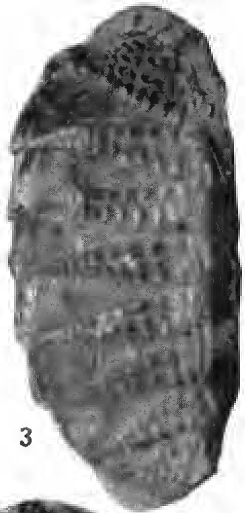

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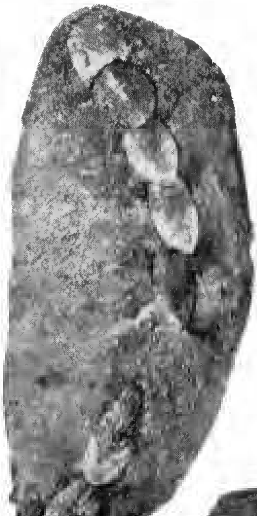

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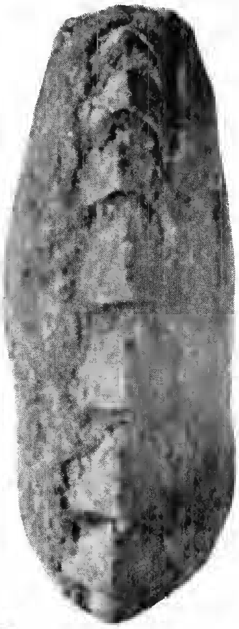

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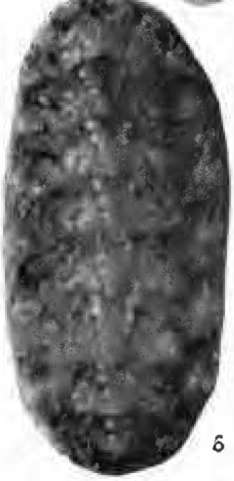

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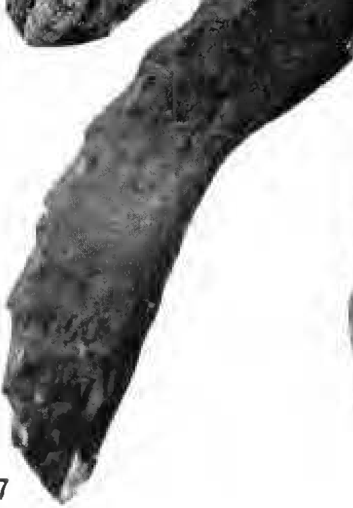

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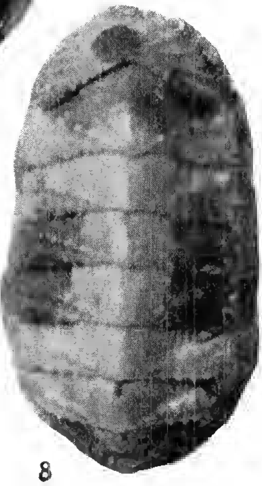

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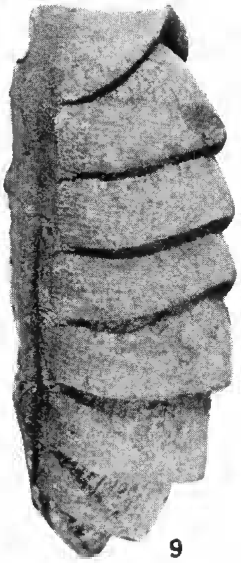

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